

The Demand for Resources

This chapter is the first of three that examine the market for economic resources such as labor, capital, land, and natural resources. In resource markets the demanders are the employers of the resources and the suppliers are the owners of the resources. As you already know, the demand for and the supply of a resource will determine the resource price and the quantities in a competitive market.

Chapter 12 focuses on the demand or employer side of the resource market. It offers a general explanation of what determines demand for any resource. Chapters 13 and 14 discuss the characteristics of the market for particular resources—labor, capital, land, or entrepreneurial ability—and present the supply side of the resource market.

The **resource market is important** for several reasons, as you will learn in the first section of the chapter. Resource prices determine what resource owners (or households) receive in exchange for supplying their resources, and thus they determine the incomes of households. Prices allocate resources to their most efficient uses and encourage the least costly methods of production in our economy. Many public policy issues also involve resource pricing, such as setting a minimum wage.

The next section of the chapter focuses on the **marginal productivity theory of resource demand**. When a firm wishes to maximize its profits, it produces that output at which marginal revenue and marginal cost are equal. But how much of each resource does the firm hire if it wishes to maximize its profits? You will learn that the firm hires that amount of each resource up to the point that the marginal revenue product and the marginal resource cost of that resource are equal ($MRP = MRC$).

There is another similarity between the output and the resource markets for the firm. Recall that the competitive firm's supply curve is a portion of its marginal-cost curve. The purely competitive firm's demand curve for a resource is a portion of its marginal-revenue-product curve. Just as cost is the important determinant of supply, the revenue derived from the use of a resource is the important factor determining the demand for that resource in a competitive market for resources.

The next major section of the chapter presents the **determinants of resource demand**. Three major ones are discussed—changes in product demand, productivity, and the prices of other resources. The last one is the most complicated because you must consider whether the

other resources are substitutes or complements and also the underlying factors affecting them.

This chapter has a section on the **elasticity of resource demand**, which is no different from the elasticity concept you learned about in Chapter 6. In this case, it is the relation of the percentage change in quantity demanded of the resource to a percentage change in the price of the resource. As you will discover, three factors that affect elasticity are the availability of other substitute resources, the elasticity of product demand, and the ratio of resource cost to total cost.

Most of the chapter examines the situation in which there is only one variable resource. The next-to-last section of the chapter, however, offers a general perspective on the **combination of resources** the firm will choose to use when multiple inputs are used and all inputs are variable. Two rules are presented. The least-cost rule states that the firm will minimize costs when the last dollar spent on each resource results in the same marginal product. The profit-maximizing rule means that in a competitive market the firm will maximize its profits when each resource is used so that its marginal product is equal to its price. The second rule is equally important because a firm that employs the quantity of resources that maximizes its profits also produces the output that maximizes its profits and is thus producing at the least cost.

The marginal productivity theory of resource demand is not without criticism, as you will learn in the last section of the chapter. If resource prices reflect marginal productivity, then this relationship can produce income inequality in society. In addition, market imperfection may skew the distribution of income.

■ CHECKLIST

When you have studied this chapter you should be able to

- ☐ Present four reasons for studying resource pricing.
- ☐ Explain why the demand for an economic resource is a derived demand.
- ☐ Define the marginal revenue product and relate it to the productivity and price of a resource.
- ☐ Determine the marginal-revenue-product schedule of a resource for a product sold in a purely competitive market, when given the data.
- ☐ Define the marginal resource cost.
- ☐ State the rule used by a profit-maximizing firm to determine how much of a resource it will employ.

- ☐ Apply the $MRP = MRC$ rule to determine the quantity of a resource a firm will hire, when you are given the necessary data.
- ☐ Explain why the marginal-revenue-product schedule of a resource is the firm's demand for the resource.
- ☐ Find the marginal-revenue-product schedule of a resource for a product sold in an imperfectly competitive market, when given the data.
- ☐ Derive the market demand for a resource.
- ☐ List the three factors which would change a firm's demand for a resource.
- ☐ Predict the effect on resource demand of an increase or decrease in one of its three determinants.
- ☐ Give trends on the occupations with the fastest growth in jobs both in percentage terms and in absolute numbers.
- ☐ State three determinants of the price elasticity of resource demand.
- ☐ Describe how a change in each determinant would change the price elasticity of demand for a resource.
- ☐ State the rule used by a firm for determining the least-cost combination of resources.
- ☐ Use the least-cost rule to find the least-cost combination of resources for production, when given data.
- ☐ State the rule used by a profit-maximizing firm to determine the quantity of each of several resources to employ.
- ☐ Apply the profit-maximizing rule to determine the quantity of each resource a firm will hire, when given the data.
- ☐ Explain the marginal productivity theory of income distribution.
- ☐ Give two criticisms of the marginal productivity theory of income distribution.
- ☐ Explain using the least-cost rule why ATMs have replaced tellers (Last Word).

■ CHAPTER OUTLINE

1. The study of what determines the prices of resources *is important* because resource prices influence the size of individual incomes and the resulting distribution of income. They allocate scarce resources and affect the way in which firms combine resources in production. Resource pricing also raises policy and ethical issues about income distribution.
2. The marginal productivity theory of resource demand assumes that the firm is a "price taker" or "wage taker" in the resource market.
 - a. The demand for a single resource is a **derived demand** that depends on the demand for the goods and services it can produce.
 - b. Because resource demand is a derived demand, it depends on two factors: the marginal productivity of the resource and the market price of the good or service it is used to produce.
 - (1) **Marginal revenue product (MRP)** is the change in total revenue divided by a one-unit change in resource quantity.
 - (2) It combines two factors—the **marginal product** (the additional output from each additional unit of resource) of a resource and the market price of the product it produces—into a single useful tool.
 - c. **Marginal resource cost (MRC)** is the change in total resource cost divided by a one-unit change in resource quantity. A firm will hire resources until the marginal revenue product of the resource is equal to its marginal resource cost ($MRP = MRC$).
 - d. The firm's marginal-revenue-product schedule for a resource is that firm's demand schedule for the resource.
 - e. If a firm sells its output in an **imperfectly competitive product market**, the more the firm sells, the lower the price of the product becomes. This causes the firm's marginal-revenue-product (resource demand) schedule to be less elastic than it would be if the firm sold its output in a purely competitive market.
 - f. The market (or total) demand for a resource is the horizontal summation of the demand schedules of all firms using the resource.
3. The **determinants of resource demand** are changes in the demand for the product produced, changes in the productivity of the resource, and changes in the prices of other resources.
 - a. A change in the demand for a product produced by a resource will change the demand of a firm for labor in the same direction.
 - b. A change in the productivity of a resource will change the demand of a firm for the resource in the same direction.
 - c. A change in the price of a
 - (1) **substitute resource** will change the demand for a resource in the same direction if the **substitution effect** outweighs the **output effect** and in the opposite direction if the output effect outweighs the substitution effect
 - (2) **complementary resource** will change the demand for a resource in the opposite direction
 - d. Changes in the demand for labor have significant effects on employment growth in occupations, both in percentage and absolute terms. Projections (2006–2016) are reported for the fastest growing occupations (e.g., network systems and data communication analysts; home health aides) and the most rapidly declining occupations (e.g., photographic processing machine operators; file clerks).
4. The price **elasticity of resource demand** measures the sensitivity of resource quantity to changes in resource prices.
 - a. Three factors affect the price elasticity of resource demand:
 - (1) the ease of substitution of other resources: the greater the substitutability of other resources, the more elastic the resource demand
 - (2) the elasticity of the demand for the product that the resource produces: the more elastic the product demand, the more elastic the resource demand
 - (3) the ratio of labor cost to total cost: the greater the ratio of labor cost to total cost, the greater the price elasticity of demand for labor.

5. Firms often employ more than one resource in producing a product.

a. The firm employing resources in purely competitive markets is hiring resources in the **least-cost combination of resources** when the ratio of the marginal product of a resource to its price is the same for all the resources the firm hires.

b. The firm is hiring resources in the **profit-maximizing combination of resources** if it hires resources in a purely competitive market when the marginal revenue product of each resource is equal to the price of that resource.

c. A numerical example illustrates the least-cost and profit-maximizing rules for a firm that employs resources in purely competitive markets.

6. The **marginal productivity theory of income distribution** seems to result in an equitable distribution of income because each unit of a resource receives a payment equal to its marginal contribution to the firm's revenue. The theory has at least two serious faults.

a. The distribution of income will be unequal because resources are unequally distributed among individuals in the economy.

b. The income of those who supply resources will not be based on their marginal productivities if there is monopsony or monopoly in the resource markets of the economy.

7. (Last Word). ATMs have eliminated many human teller positions over the past few decades as explained by the resource theory presented in this chapter. The least-cost combination of resources rule implies that firms will change inputs in response to technological change or changes in input prices. If the marginal product of an ATM divided by its price is greater than the marginal product of a human teller divided by its price, then more ATMs will be used in the banking sector.

■ HINTS AND TIPS

1. The list of important terms for Chapter 12 is relatively short, but included in the list are two very important concepts—**marginal revenue product** and **marginal resource cost**—which you must grasp if you are to understand how much of a resource a firm will hire. These two concepts are similar to, but not identical with, the marginal-revenue and marginal-cost concepts used in the study of product markets and in the explanation of the quantity of output a firm will produce.

2. Marginal revenue and marginal cost are, respectively, the change in the firm's total revenue and the change in the firm's total cost when it produces and sells an additional unit of *output*. Marginal revenue product and marginal resource cost are, respectively, the change in the firm's total revenue and the change in the firm's total cost when it hires an additional unit of *input*. Note that the two new concepts deal with changes in revenue and costs as a consequence of hiring more of a *resource*.

3. The marginal revenue product (MRP) of a resource is simply the marginal product of the resource (MP) times

the price of the product that the resource produces (P), or $MRP = MP \times P$. Under pure competition, MP changes, but P is constant as more resources are added to production. Under imperfect competition, both MP and P change as more resources are added, and thus each variable (MP and P) affects MRP. Compare the data in Tables 12.1 and 12.2 in the textbook to see this difference.

4. Make sure you understand the rule **MRP = MRC**. A firm will hire one more unit of a resource only so long as the resource adds more to the firm's revenues than it does to its costs. If $MRP > MRC$, the firm will hire more resources. If $MRP < MRC$, the firm will cut back on resource use.

5. It can be difficult to figure out what outcome will result from a change in the price of a substitute resource (capital) on the demand for another resource (labor). It is easy to understand why the demand for labor might decrease if the price of capital decreases because cheaper capital would be substituted for labor. It is harder to explain why the opposite might be true. That insight requires an understanding of both the **substitution effect** and the **output effect**. Find out how one effect may offset the other.

6. The **profit-maximizing rule** for a combination of resources may seem difficult, but it is relatively simple. Just remember that the price of any resource must be equal to its marginal revenue product, and thus *the ratio must always equal 1*.

■ IMPORTANT TERMS

derived demand	elasticity of resource demand
marginal product	least-cost combination of resources
marginal revenue product (MRP)	profit-maximizing combination of resources
marginal resource cost (MRC)	marginal productivity theory of income distribution
MRP = MRC rule	
substitution effect	
output effect	

SELF-TEST

■ FILL-IN QUESTIONS

1. Resource prices allocate (revenues, resources) _____ and are one factor that determines household (incomes, costs) _____ and business _____.

2. The demand for a resource is a (constant, derived) _____ demand that depends on the (productivity, cost) of the resource and the (cost, price) _____ of the product made from the resource.

3. A firm will find it profitable to hire units of a resource up to the quantity at which the marginal revenue (cost, product) _____ equals the marginal resource _____.

4. If the firm hires the resource in a purely competitive market, the marginal resource (cost, product) _____ will be (greater than, less than, equal to) _____ the price of the resource.

5. A firm's demand schedule for a resource is the firm's marginal revenue (cost, product) _____ schedule for that resource because both indicate the quantities of the resource the firm will employ at various resource (costs, prices) _____.

6. A producer in an imperfectly competitive market finds that the more of a resource it employs, the (higher, lower) _____ becomes the price at which it can sell its product. As a consequence, the (supply, demand) _____ schedule for the resource is (more, less) _____ elastic than it would be if the output were sold in a purely competitive market.

7. Adding the quantity demanded for the resource at each and every price for each firm using the resource gives the market (supply, demand) _____ curve for the resource.

8. The demand for a resource will change if the (demand, supply) _____ of the product the resource produces changes, if the (productivity, price) _____ of the resource changes, or if the (price, elasticity) _____ of other resources change.

9. If the demand for a product increases, then the demand for the resource that produces that product will (increase, decrease) _____. Conversely, if the demand for a product decreases, then the demand for the resource that produces that product will _____.

10. When the productivity of a resource falls, the demand for the resource (rises, falls) _____, but when the productivity of a resource rises, the demand for the resource _____.

11. The output of the firm being constant, a decrease in the price of resource A will induce the firm to hire (more, less) _____ of resource A and _____ of other resources; this is called the (substitution, output) _____ effect. But if the decrease in the price of A results in lower total costs and an increase in output, the firm may hire (more, less) _____ of both resources; this is called the (substitution, output) _____ effect.

12. A decrease in the price of a complementary resource will cause the demand for labor to (increase, decrease) _____, but an increase in the price of a complementary resource will cause the demand for labor to _____.

13. The three determinants of the price elasticity of demand for a resource are the ease with which other resources can be (substitutes, complements) _____ for it, the price elasticity of (supply, demand) _____ for the product the resource produces, and the ratio of resource (demand, cost) _____ to total (demand, cost) _____.

14. If the marginal product of labor declines slowly when added to a fixed stock of capital, the demand curve for labor (MRP) will decline (rapidly, slowly) _____ and will tend to be highly (elastic, inelastic) _____.

15. The greater the substitutability of other resources for a resource, the (greater, less) _____ will be the elasticity of demand for a resource.

16. Suppose a firm employs resources in purely competitive markets. If the firm wishes to produce any given amount of its output in the least costly way, the ratio of the marginal (cost, product) _____ of each resource to its (demand, price) _____ must be the same for all resources.

17. A firm that hires resources in purely competitive markets is employing the combination of resources that will result in maximum profits for the firm when the marginal (revenue product, resource cost) _____ of every resource is equal to its (demand, price) _____.

18. If the marginal revenue product of a resource is equal to the price of that resource, the marginal revenue product divided by its price is equal to (1, infinity) _____.

19. In the marginal productivity theory, the distribution of income is an equitable one because each unit of each resource is paid an amount equal to its (total, marginal) _____ contribution to the firm's (revenues, costs) _____.

20. The marginal productivity theory rests on the assumption of (competitive, imperfect) _____ markets. In the real world, there are many labor markets with imperfections because of employer pricing or monopoly power, so wage rates and other resource prices (do, do not) _____ perfectly measure contributions to domestic output.

■ TRUE-FALSE QUESTIONS

Circle T if the statement is true, F if it is false.

1. In the resource markets of the economy, resources are demanded by business firms and supplied by households. T F

2. The prices of resources are an important factor in the determination of resource allocation. T F

3. The demand for a resource is a derived demand based on the demand for the product it produces. T F

4. A resource that is highly productive will always be in great demand. T F

5. A firm's demand schedule for a resource is the firm's marginal-revenue-product schedule for the resource. T F

6. It will be profitable for a firm to hire additional units of labor resources up to the point where the marginal revenue product of labor is equal to its marginal resource cost. T F

7. A firm with one worker can produce 30 units of a product that sells for \$4 a unit, but the same firm with two workers can produce 70 units of that product. The marginal revenue product of the second worker is \$400. T F

8. The competitive firm's marginal revenue product of labor will fall as output expands because marginal product diminishes and product price falls. T F

9. A producer's demand schedule for a resource will be more elastic if the firm sells its product in a purely competitive market than it would be if it sold the product in an imperfectly competitive market. T F

10. The market demand for a particular resource is the sum of the individual demands of all firms that employ that resource. T F

11. An increase in the price of a resource will cause the demand for the resource to decrease. T F

12. The demand curve for labor will increase when the demand for (and price of) the product produced by that labor increases. T F

13. There is an inverse relationship between the productivity of labor and the demand for labor. T F

14. The demand for a resource will be increased with improvements in its quality. T F

15. When two resources are substitutes for each other, both the substitution effect and the output effect of a decrease in the price of one of these resources operate to increase the quantity of the other resource employed by the firm. T F

16. The output effect of an increase in the price of a resource increases the quantity demanded of that resource. T F

17. If two resources are complementary, an increase in the price of one will reduce the demand for the other. T F

18. Price declines for computer equipment have had stronger output effects than substitution effects, increasing the demand for computer software engineers and specialists. T F

19. The greater the substitutability of other resources, the less will be the elasticity of demand for a particular resource. T F

20. The greater the elasticity of product demand, the greater the elasticity of resource demand. T F

21. The demand for labor will be less elastic when labor is a smaller proportion of the total cost of producing a product. T F

Use the following information as the basis for answering Questions 22 and 23. The marginal revenue product and price of resource A are \$12 and a constant \$2, respectively, and the marginal revenue product and price of resource B are \$25 and a constant \$5, respectively. The firm sells its product at a constant price of \$1.

22. The firm should decrease the amount of A and increase the amount of B it employs if it wishes to decrease its total cost without affecting its total output. T F

23. If the firm wishes to maximize its profits, it should increase its employment of both A and B until their marginal revenue products fall to \$2 and \$5, respectively. T F

24. The marginal productivity theory of income distribution results in an equitable distribution if resource markets are competitive. T F

25. The marginal productivity theory rests on the assumption of imperfectly competitive markets. T F

■ MULTIPLE-CHOICE QUESTIONS

Circle the letter that corresponds to the best answer.

- The prices paid for resources affect
 - the money incomes of households in the economy
 - the allocation of resources among different firms and industries in the economy
 - the quantities of different resources employed to produce a particular product
 - all of the above
- In a competitive resource market, the firm employing a resource such as labor is a
 - price maker
 - cost maker
 - wage taker
 - revenue taker
- The demand for a resource is *derived* from the
 - demand for the products it helps produce
 - price of the resource
 - supply of the resource
 - income of the firm selling the resource
- The law of diminishing returns explains why
 - the MRP of an input in a purely competitive market decreases as a firm increases the quantity of an employed resource
 - the MRC of an input in a purely competitive market decreases as a firm increases the quantity of an employed resource
 - resource demand is a derived demand
 - there are substitution and output effects for resources

Answer Questions 5, 6, and 7 on the basis of the information in the following table for a purely competitive market.

Number of workers	Total product	Product price (\$)
0	0	4
1	16	4
2	26	4
3	34	4
4	40	4
5	44	4

5. At a wage rate of \$15, the firm will choose to employ
 (a) 2 workers
 (b) 3 workers
 (c) 4 workers
 (d) 5 workers
6. At a wage rate of \$30, the firm will choose to employ
 (a) 2 workers
 (b) 3 workers
 (c) 4 workers
 (d) 5 workers
7. If the product price increases to a constant \$8, then at a wage rate of \$30, the firm will choose to employ
 (a) 2 workers
 (b) 3 workers
 (c) 4 workers
 (d) 5 workers

Use the following total-product and marginal-product schedules for a resource to answer Questions 8, 9, 10, and 11. Assume that the quantities of other resources the firm employs remain constant.

Units of resource	Total product	Marginal product
0	0	—
1	8	8
2	14	6
3	18	4
4	21	3
5	23	2

8. If the product the firm produces sells for a constant \$3 per unit, the marginal revenue product of the fourth unit of the resource is

- (a) \$3
 (b) \$6
 (c) \$9
 (d) \$12

9. If the firm's product sells for a constant \$3 per unit and the price of the resource is a constant \$15, the firm will employ how many units of the resource?

- (a) 2
 (b) 3
 (c) 4
 (d) 5

10. If the firm can sell 14 units of output at a price of \$1 per unit and 18 units of output at a price of \$0.90 per

unit, the marginal revenue product of the third unit of the resource would be

- (a) \$4
 (b) \$3.60
 (c) \$2.20
 (d) \$0.40

11. If the firm can sell 8 units at a price of \$1.50, 14 units at a price of \$1.00, 18 units at a price of \$0.90, 21 units at a price of \$0.70, and 23 units at a price of \$0.50, then the firm is

- (a) maximizing profits at a product price of \$0.50
 (b) minimizing its costs at a product price of \$1.00
 (c) selling in an imperfectly competitive market
 (d) selling in a purely competitive market

12. As a firm that sells its product in an imperfectly competitive market increases the quantity of a resource it employs, the marginal revenue product of that resource falls because

- (a) the price paid by the firm for the resource falls
 (b) the marginal product of the resource falls
 (c) the price at which the firm sells its product falls
 (d) both the marginal product and the price at which the firm sells its product fall

13. Which would increase a firm's demand for a particular resource?

- (a) an increase in the prices of complementary resources used by the firm
 (b) a decrease in the demand for the firm's product
 (c) an increase in the productivity of the resource
 (d) an increase in the price of the particular resource

14. The substitution effect indicates that a firm will use

- (a) more of an input whose relative price has decreased
 (b) more of an input whose relative price has increased
 (c) less of an input whose relative price has decreased
 (d) less of an input whose relative price has remained constant

15. Suppose resource A and resource B are substitutes and the price of A increases. If the output effect is greater than the substitution effect,

- (a) the quantity of A employed by the firm will increase and the quantity of B employed will decrease
 (b) the quantities of both A and B employed by the firm will decrease
 (c) the quantities of both A and B employed by the firm will increase
 (d) the quantity of A employed will decrease and the quantity of B employed will increase

16. Two resource inputs, capital and labor, are complementary and used in fixed proportions. A decrease in the price of capital will

- (a) increase the demand for labor
 (b) decrease the demand for labor
 (c) decrease the quantity demanded for labor
 (d) have no effect because the relationship is fixed

17. Which would result in an increase in the elasticity of demand for a particular resource?

- (a) an increase in the demand for the resource
- (b) a decrease in the elasticity of demand for the product that the resource helps to produce
- (c) an increase in the percentage of the firm's total costs accounted for by the resource
- (d) a decrease in the ease of resource substitutability for the particular resource

18. The demand for labor would most likely become more inelastic as a result of

- (a) an increase in the elasticity of the demand for the product that the labor produces
- (b) an increase in the time for employers to make technological changes or purchase new equipment
- (c) a decrease in the proportion of labor costs to total costs
- (d) a decrease in the demand for the product

19. A firm is allocating its expenditures for resources in a way that will result in the least total cost of producing any given output when the

- (a) amount the firm spends on each resource is the same
- (b) marginal revenue product of each resource is the same
- (c) marginal product of each resource is the same
- (d) marginal product per dollar spent on the last unit of each resource is the same

20. A business is employing inputs such that the marginal product of labor is 20 and the marginal product of capital is 45. The price of labor is \$10 and the price of capital is \$15. If the business wants to minimize costs while keeping output constant, then it should

- (a) use more labor and less capital
- (b) use less labor and less capital
- (c) use less labor and more capital
- (d) make no change in resource use

21. Assume that a computer disk manufacturer is employing resources so that the MRP of the last unit hired for resource X is \$240 and the MRP of the last unit hired for resource Y is \$150. The price of resource X is \$80 and the price of resource Y is \$50. To maximize profit the firm should

- (a) hire more of resource X and less of resource Y
- (b) hire less of resource X and more of resource Y
- (c) hire less of both resource X and resource Y
- (d) hire more of both resource X and resource Y

22. Which does not suggest that a firm that hires resources in a purely competitive market is maximizing its profits?

- (a) The marginal revenue product of every resource is equal to 1.
- (b) The marginal revenue product of every resource is equal to its price.
- (c) The ratio of the marginal revenue product of every resource to its price is equal to 1.
- (d) The ratio of the price of every resource to its marginal revenue product is equal to 1.

23. Assume that a purely competitive firm uses two resources—labor (L) and capital (C)—to produce a product. In which situation would the firm be maximizing profit?

	MRP _L	MRP _C	P _L	P _C
(a)	10	20	30	40
(b)	10	20	10	20
(c)	15	15	10	10
(d)	30	40	10	5

24. In the marginal productivity theory of income distribution, when all markets are purely competitive, each unit of each resource receives a money payment equal to

- (a) its marginal product
- (b) its marginal revenue product
- (c) the needs of the resource owner
- (d) the payments received by each of the units of the other resources in the economy

25. A major criticism of the marginal productivity theory of income distribution is that

- (a) the demand for labor resources is price elastic
- (b) labor markets are often subject to imperfect competition
- (c) the theory suggests that there will be equality in incomes
- (d) purely competitive firms are only interested in profit maximization

■ PROBLEMS

1. The table below shows the total production a firm will be able to obtain if it employs varying amounts of resource A while the amounts of the other resources the firm employs remain constant.

Quantity of resource A employed	Total product	Marginal product of A	Total revenue	Marginal revenue product of A
0	0		\$ _____	
1	12	_____	_____	\$ _____
2	22	_____	_____	_____
3	30	_____	_____	_____
4	36	_____	_____	_____
5	40	_____	_____	_____
6	42	_____	_____	_____
7	43	_____	_____	_____

- a. Compute the marginal product of each of the seven units of resource A and enter these figures in the table.
- b. Assume the product the firm produces sells in the market for \$1.50 per unit. Compute the total revenue of the firm at each of the eight levels of output and the marginal revenue product of each of the seven units of resource A. Enter these figures in the table below.
- c. On the basis of your computations, complete the firm's demand schedule for resource A by indicating in the following table how many units of resource A the firm would employ at the given prices.

Price of A	Quantity of A demanded
\$21.00	_____
18.00	_____
15.00	_____
12.00	_____
9.00	_____
6.00	_____
3.00	_____
1.50	_____

2. In the table below are the marginal product data for resource B. Assume that the quantities of other resources employed by the firm remain constant.

- a. Compute the total product (output) of the firm for each of the seven quantities of resource B employed and enter these figures in the table.
- b. Assume that the firm sells its output in an imperfectly competitive market and that the prices at which it can sell its product are those given in the table. Compute and enter in the table:

(1) the total revenue for each of the seven quantities of B employed.

(2) the marginal revenue product of each of the seven units of resource B.

c. How many units of B would the firm employ if the market price of B were

- (1) \$25? _____
- (2) \$20? _____
- (3) \$15? _____
- (4) \$9? _____
- (5) \$5? _____
- (6) \$1? _____

Quantity of resource B employed	Marginal product of B	Total product	Product price	Total revenue	Marginal revenue product of B
0	—	0		\$0.00	—
1	22	_____	\$1.00	_____	_____
2	21	_____	.90	_____	_____
3	19	_____	.80	_____	_____
4	16	_____	.70	_____	_____
5	12	_____	.60	_____	_____
6	7	_____	.50	_____	_____
7	1	_____	.40	_____	_____

3. Use the following total-product schedule as a resource to answer questions a, b, and c. Assume that the quantities of other resources the firm employs remain constant.

Units of resource	Total product
0	0
1	15
2	28
3	38
4	43
5	46

a. If the firm's product sells for a constant \$2 per unit, what is the marginal revenue product of the second unit of the resource? _____

b. If the firm's product sells for a constant \$2 and the price of the resource is \$10, how many units of the resource will the firm employ? _____

c. If the firm can sell 15 units of output at a price of \$2.00 and 28 units of output at a price of \$1.50, what is the marginal revenue product of the second unit of the resource? _____

4. In the space to the right of each of the following changes, indicate whether the change would tend to increase (+) or decrease (–) a firm's demand for a particular resource.

a. An increase in the demand for the firm's product _____

b. A decrease in the price of the firm's output _____

c. An increase in the productivity of the resource _____

d. An increase in the price of a substitute resource when the output effect is greater than the substitution effect _____

e. A decrease in the price of a complementary resource _____

f. A decrease in the price of a substitute resource when the substitution effect is greater than the output effect _____

Quantity of resource C employed	Marginal product of C	Marginal revenue product of C	Quantity of Resource D employed	Marginal product of D	Marginal revenue product of D
1	10	\$5.00	1	21	\$10.50
2	8	4.00	2	18	9.00
3	6	3.00	3	15	7.50
4	5	2.50	4	12	6.00
5	4	2.00	5	9	4.50
6	3	1.50	6	6	3.00
7	2	1.00	7	3	1.50

5. The above table shows the marginal-product and marginal-revenue-product schedules for resource C and resource D. Both resources are variable and are employed in purely competitive markets. The price of C is \$2 and the price of D is \$3. (Assume that the productivity of each resource is independent of the quantity of the other.)

a. The least-cost combination of C and D that would enable the firm to produce

(1) units of its product is _____ C and _____ D.

(2) 99 units of its product is _____ C and _____ D.

b. The profit-maximizing combination of C and D is _____ C and _____ D.

c. When the firm employs the profit-maximizing combination of C and D, it is also employing C and D in the least-cost combination because _____ equals _____.

d. Examination of the figures in the table reveals that the firm sells its product in a _____ competitive market at a price of \$_____.

e. Employing the profit-maximizing combination of C and D, the firm's

(1) total output is _____.

(2) total revenue is \$_____.

(3) total cost is \$_____.

(4) total profit is \$_____.

■ SHORT ANSWER AND ESSAY QUESTIONS

1. Give four reasons why it is important to study resource pricing.

2. How does the demand for a product differ from the demand for a resource? Explain why the demand for a resource is a derived demand.

3. What two factors determine the strength of the demand for a resource?

4. Explain why firms that wish to maximize their profits follow the $MRP = MRC$ rule.

5. What effects do marginal product and marginal price have on a firm's resource demand curve under pure competition and under imperfect competition?

6. Why is the demand schedule for a resource less elastic when the firm sells its product in an imperfectly competitive market than when it sells it in a purely competitive market?

7. How do you derive the market demand for a resource?

8. Identify and describe three factors that will cause the demand for a resource to increase or decrease. Give examples of how each factor influences changes in demand.

9. What is the difference between the substitution effect and the output effect?

10. If the price of capital falls, what will happen to the demand for labor if capital and labor are substitutes in production? Describe what happens when the substitution effect outweighs the output effect and when the output effect outweighs the substitution effect. What can you conclude?

11. Why does a change in the price of a complementary resource cause the demand for labor to change in the opposite direction?

12. Describe trends in occupational employment data. Give examples of jobs with the greatest projected growth and decline.

13. What are the three factors that determine the elasticity of demand for a resource?

14. Use an example to explain what happens to elasticity when substitutability for a resource is greater rather than lesser.

15. How can the ratio of labor cost to the total cost influence how producers react to changes in the price of labor?

16. Assume that a firm employs resources in purely competitive markets. How does the firm know that it is spending money on resources in such a way that it can produce a given output for the least total cost?

17. Why is minimizing cost not sufficient for maximizing profit for a firm?

18. When is a firm that employs resources in purely competitive markets using these resources in amounts that will maximize the profits of the firm?

19. What is the marginal productivity theory of income distribution? What ethical proposition must be accepted if this distribution is to be fair and equitable?

20. What are the two major shortcomings of the marginal productivity theory of income distribution?

ANSWERS

Chapter 12 The Demand for Resources

FILL-IN QUESTIONS

- resources, incomes, costs
- derived, productivity, price
- product, cost
- cost, equal to
- product, prices
- lower, demand, less
- demand
- demand, productivity, price
- increase, decrease
- falls, rises
- more, less, substitution, more, output
- increase, decrease
- substitutes, demand, cost, cost
- slowly, elastic
- greater
- product, price
- revenue product, price
- 1
- marginal, revenues
- competitive, do not

TRUE-FALSE QUESTIONS

- | | |
|--------------------|--------------------|
| 1. T, p. 252 | 14. T, pp. 257–258 |
| 2. T, p. 253 | 15. F, p. 258 |
| 3. T, p. 253 | 16. F, p. 258 |
| 4. F, pp. 253–254 | 17. T, pp. 258–259 |
| 5. T, p. 254 | 18. T, pp. 258–259 |
| 6. T, p. 254 | 19. F, pp. 260–261 |
| 7. F, p. 254 | 20. T, pp. 260–261 |
| 8. F, p. 254 | 21. T, pp. 260–261 |
| 9. T, pp. 254–256 | 22. F, pp. 263–264 |
| 10. T, pp. 256–257 | 23. T, pp. 262–263 |
| 11. F, p. 257 | 24. F, pp. 264–265 |
| 12. T, p. 257 | 25. F, pp. 264–265 |
| 13. F, pp. 257–258 | |

MULTIPLE-CHOICE QUESTIONS

- | | |
|--------------------|--------------------|
| 1. d, p. 253 | 14. a, p. 258 |
| 2. c, p. 253 | 15. b, p. 258 |
| 3. a, p. 253 | 16. a, pp. 258–259 |
| 4. a, pp. 253–254 | 17. c, pp. 260–261 |
| 5. d, pp. 254–255 | 18. c, pp. 260–261 |
| 6. b, pp. 254–255 | 19. d, p. 262 |
| 7. d, pp. 254–255 | 20. c, pp. 263–264 |
| 8. c, pp. 254–255 | 21. d, p. 264 |
| 9. a, pp. 254–255 | 22. a, p. 264 |
| 10. c, pp. 254–255 | 23. b, pp. 263–264 |
| 11. c, pp. 254–255 | 24. b, pp. 264–265 |
| 12. d, pp. 255–256 | 25. b, pp. 264–265 |
| 13. c, pp. 257–258 | |

PROBLEMS

- a. Marginal product of A: 12, 10, 8, 6, 4, 2, 1; b. Total revenue: 0, 18.00, 33.00, 45.00, 54.00, 60.00, 63.00, 64.50; Marginal revenue product of A: 18.00, 15.00, 12.00, 9.00, 6.00, 3.00, 1.50; c. 0, 1, 2, 3, 4, 5, 6, 7
- a. Total product: 22, 43, 62, 78, 90, 97, 98; b. (1) Total revenue: 22.00, 38.70, 49.60, 54.60, 54.00, 48.50, 39.20, (2) Marginal revenue product of B: 22.00, 16.70, 10.90, 5.00, -0.60, -5.50, -9.30; c. (1) 0, (2) 1, (3) 2, (4) 3, (5) 4, (6) 4
- a. \$26. The second worker increases TP by 13 units ($13 \times \$2 = \26); b. 4 units. The marginal product of the fourth resource is 5 units of output ($5 \times \$2 = \10). Thus $MRP = \$10$ and $MRC = \$10$ when the fourth resource is employed; c. \$12. The total revenue from 1 unit is \$30.00 ($15 \times \2.00). The total revenue with 2 units is \$42 ($28 \times \1.50). The difference is the MR of the second unit.
- a. +; b. -; c. +; d. -; e. +; f. -
- a. (1) 1, 3, (2) 3, 5; b. 5, 6; c. the marginal product of C divided by its price, the marginal product of D divided by its price; d. purely, \$.50; e. (1) 114, (2) \$57, (3) \$28, (4) \$29

SHORT ANSWER AND ESSAY QUESTIONS

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|----------------|-----------------|
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| 2. p. 253 | 12. pp. 259–260 |
| 3. pp. 253–254 | 13. pp. 260–261 |
| 4. p. 254 | 14. p. 261 |
| 5. pp. 254–256 | 15. p. 261 |
| 6. pp. 255–256 | 16. p. 262 |
| 7. pp. 256–257 | 17. p. 262 |
| 8. pp. 257–259 | 18. pp. 262–264 |
| 9. p. 258 | 19. pp. 264–265 |
| 10. p. 258 | 20. pp. 264–265 |